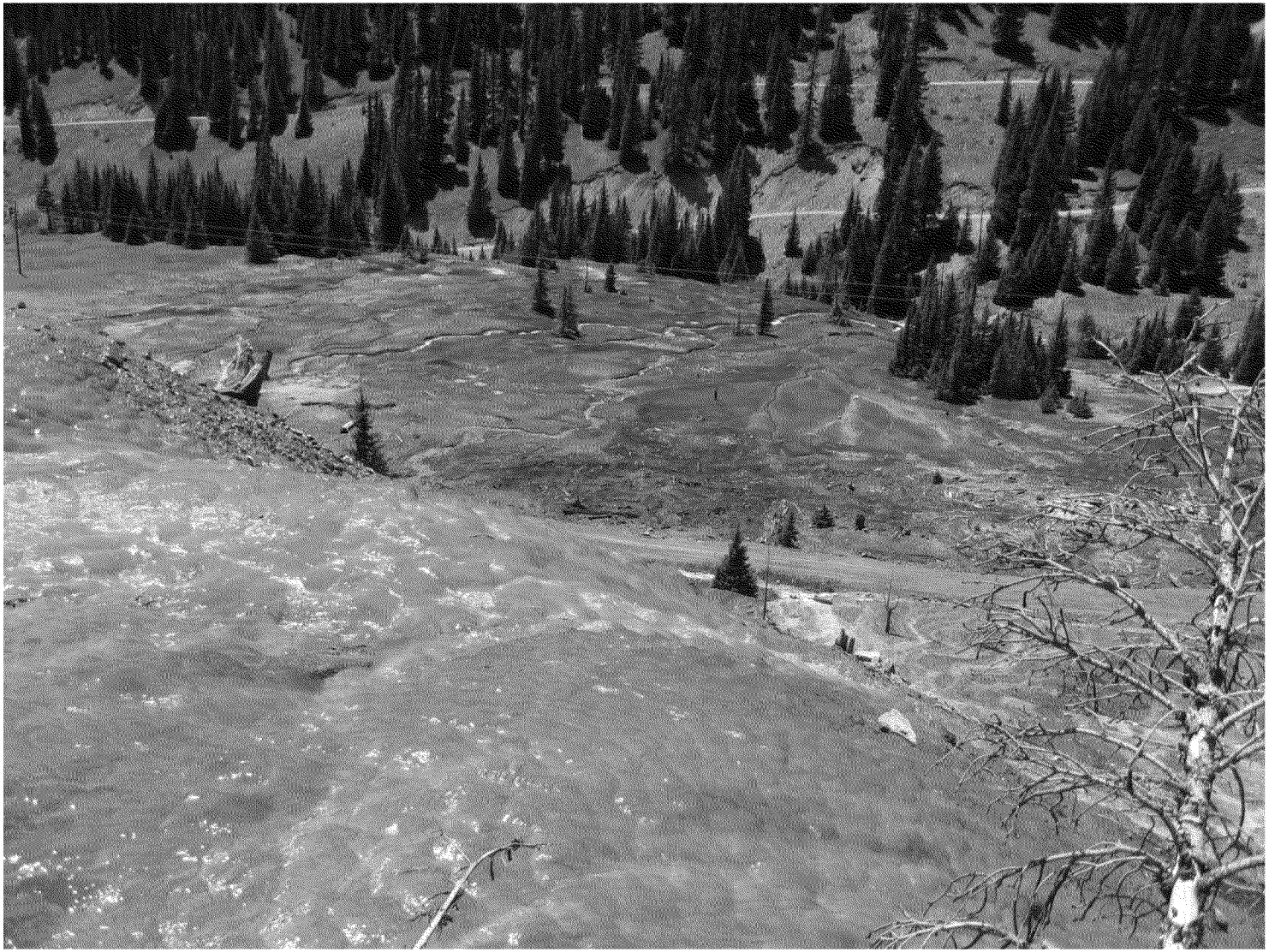
Red and Bonita Mine

Removal Assessment Summary

February 2014

Red and Bonita Waste Dump and Adit Flow

R n B Mine – waste dump view to Cement Ck



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08/12/2013


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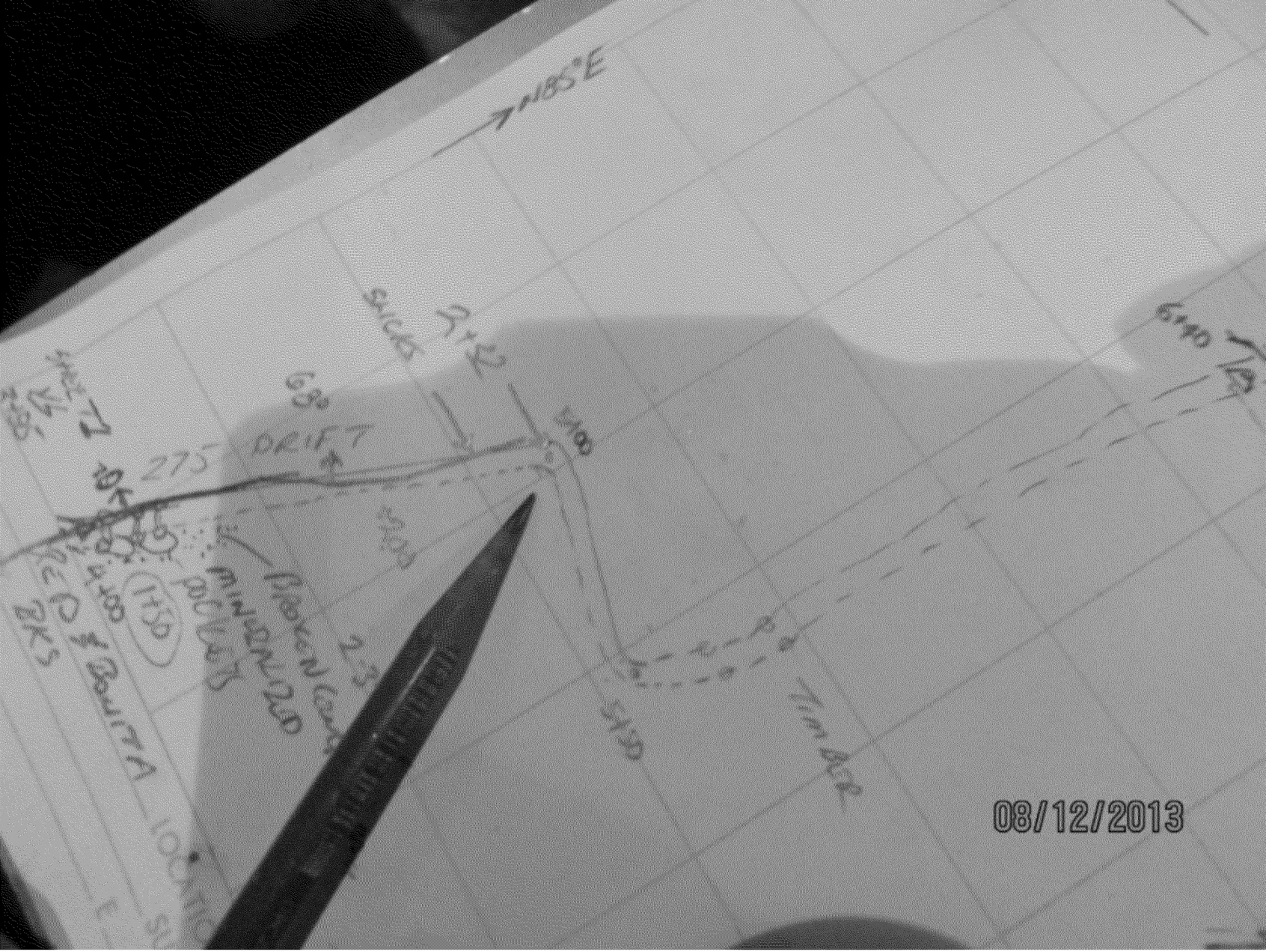
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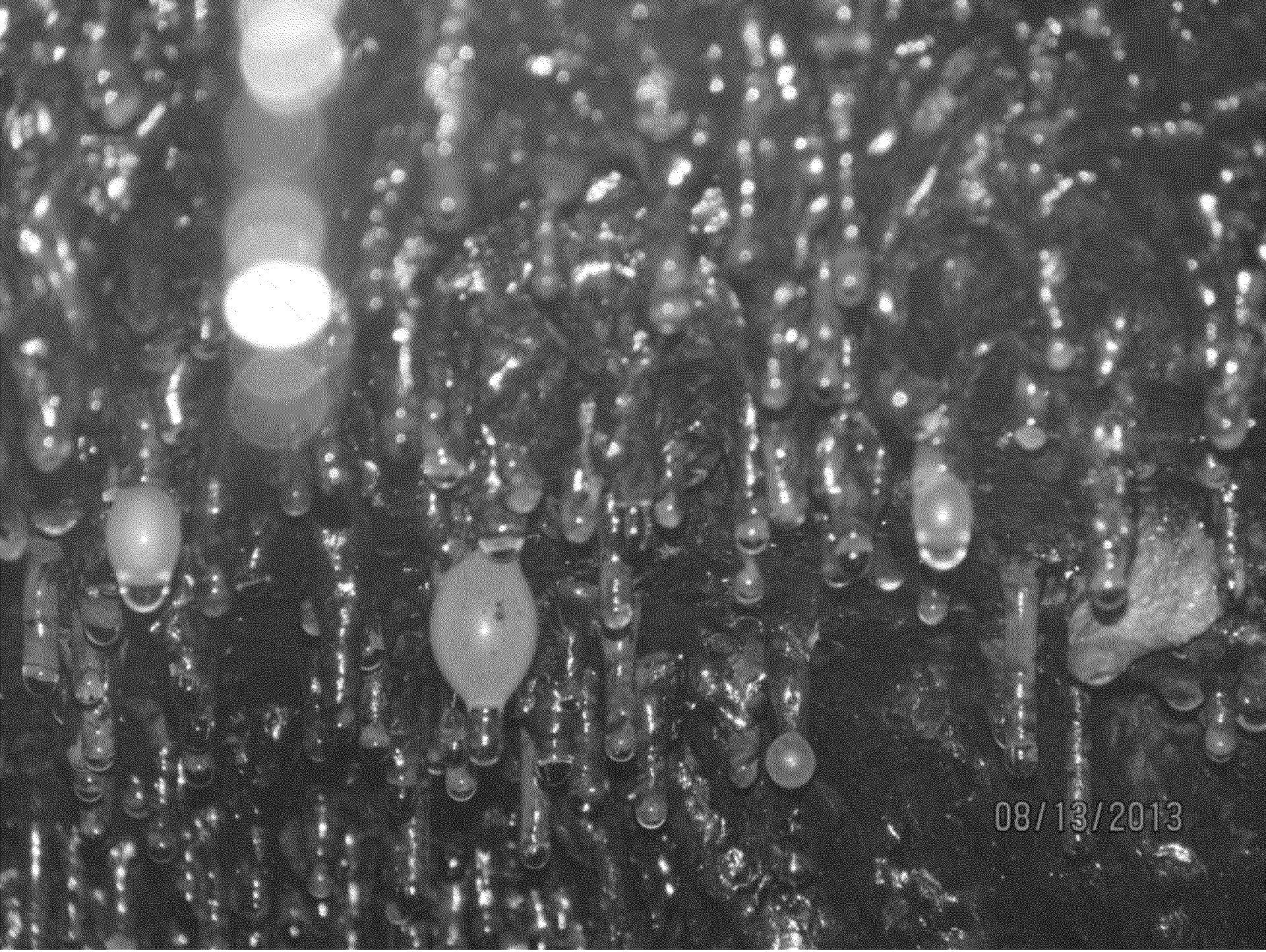
TO RIGHT
7469 SLOPE MT.
08/13/2013


08/12/2013


08/13/2013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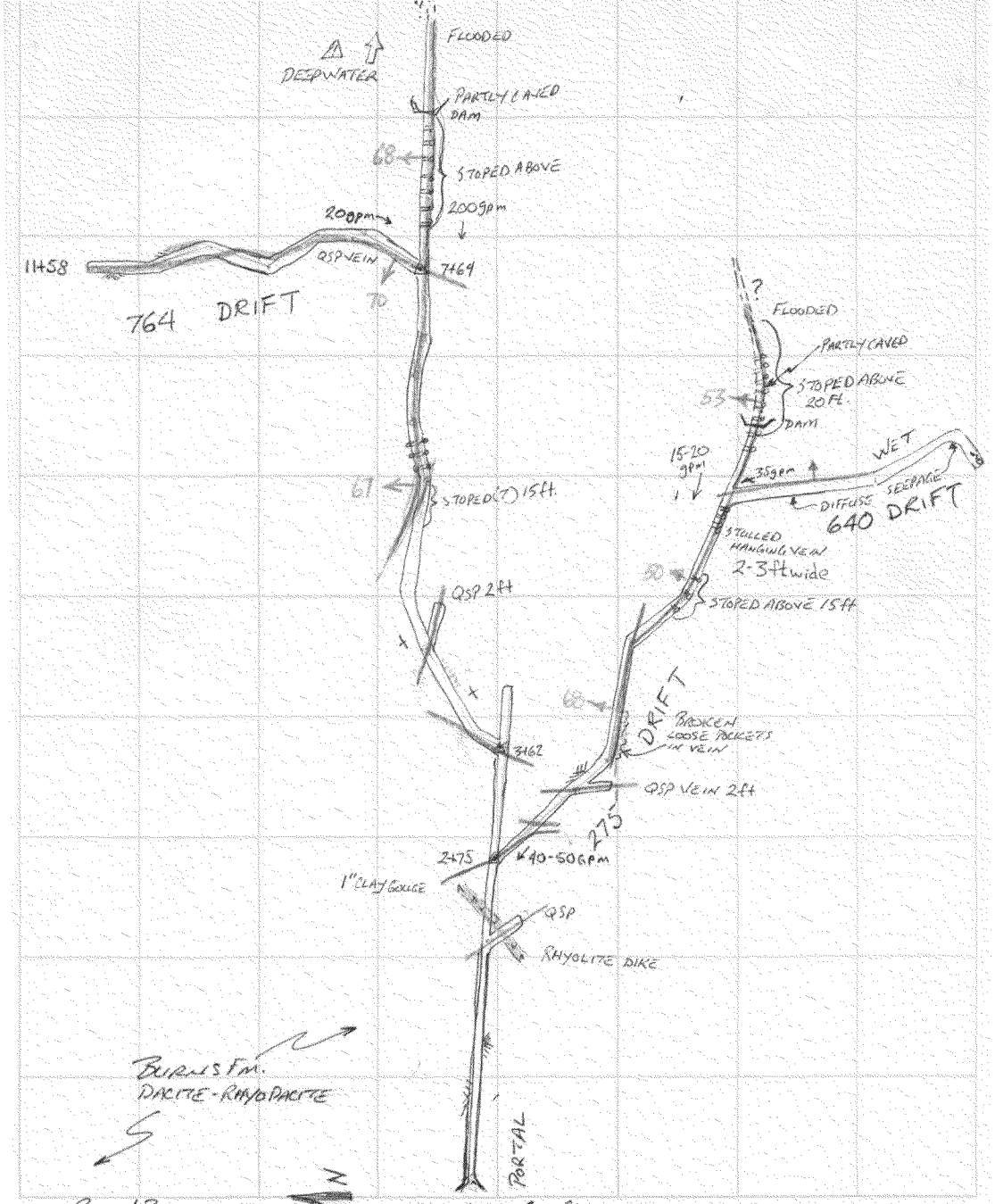
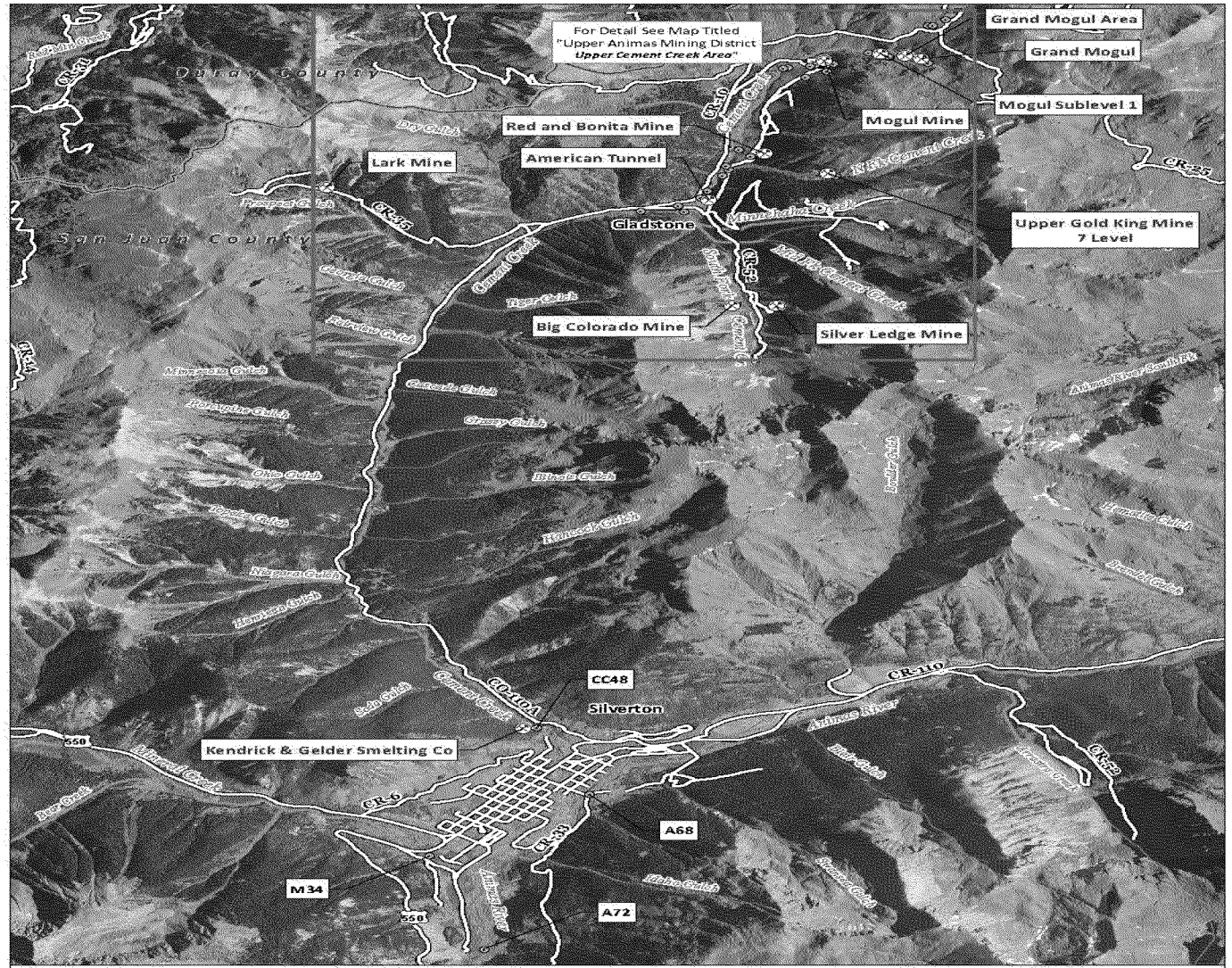


MINE RED & BONITTA LOCATION SAN JUAN CO. CO LEVEL MILL LVL

GEOLOGY BY BKS SURVEY DATE 13/AUG/2013 SCALE 1"=100ft

N E EL

Analyte	Red & Bonita Adit Sample Location and Result (µg/L)							
	2+75 Drift to Right (est 40 GPM)		7+64 Stope (est 200 GPM)		7+64 Drift to left (est 20 GPM)		Portal before mine entry	
	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Aluminum	11400 D	11100 D	3760 D	3430 D	399 JD	410 JD	5950 D	4840 D
Cadmium	91.6 D	92 D	20 U	20.6 JD	20 U	20 U	31.3 JD	30.5 JD
Copper	33.7 D	30.1 D	20 U	20 U	21.3 JD	20 U		
Iron	87100 D	44700 D	98700 D	75000 D	72800 D	16700 D	93300 D	90400 D
Zinc	17500 D	17400 D	17100 D	16900 D	6520 D	6350 D	15900 D	16000 D



Upper Animas Mining District Area Overview

Upper Animas River and Cement Creek, Silverton, CO

TechLaw

Sample Locations
Mine Locations
Rivers and Streams
Roads
County Boundaries

Date: February 9, 2012

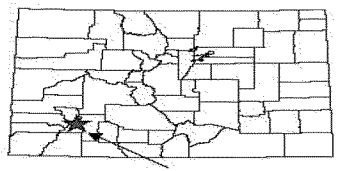
Data Sources:
Sample Locations: U.S. EPA Region 8 and UOS (2011)
Mine Locations: U.S. EPA and ESAT (2012)
Roads: Navteq (2009)
Rivers and Streams: CDOW 1:24k (2004)
County Boundaries: U.S. Census Bureau (2009)
Image: USDA NAIP (2009)

Coordinate System/Projection:
UTM Zone 13 North, NAD 83, Meters

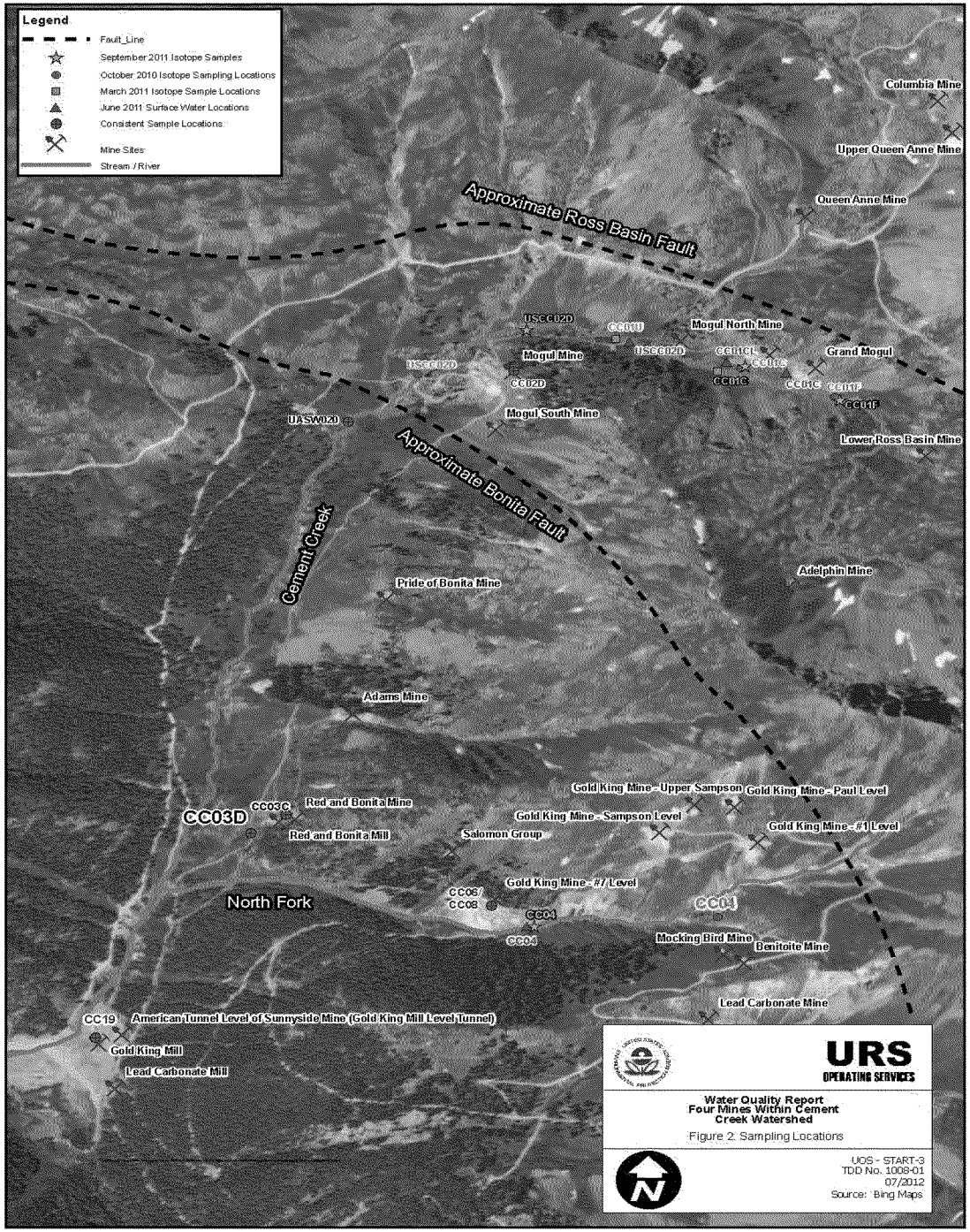
0 0.5 1 Miles

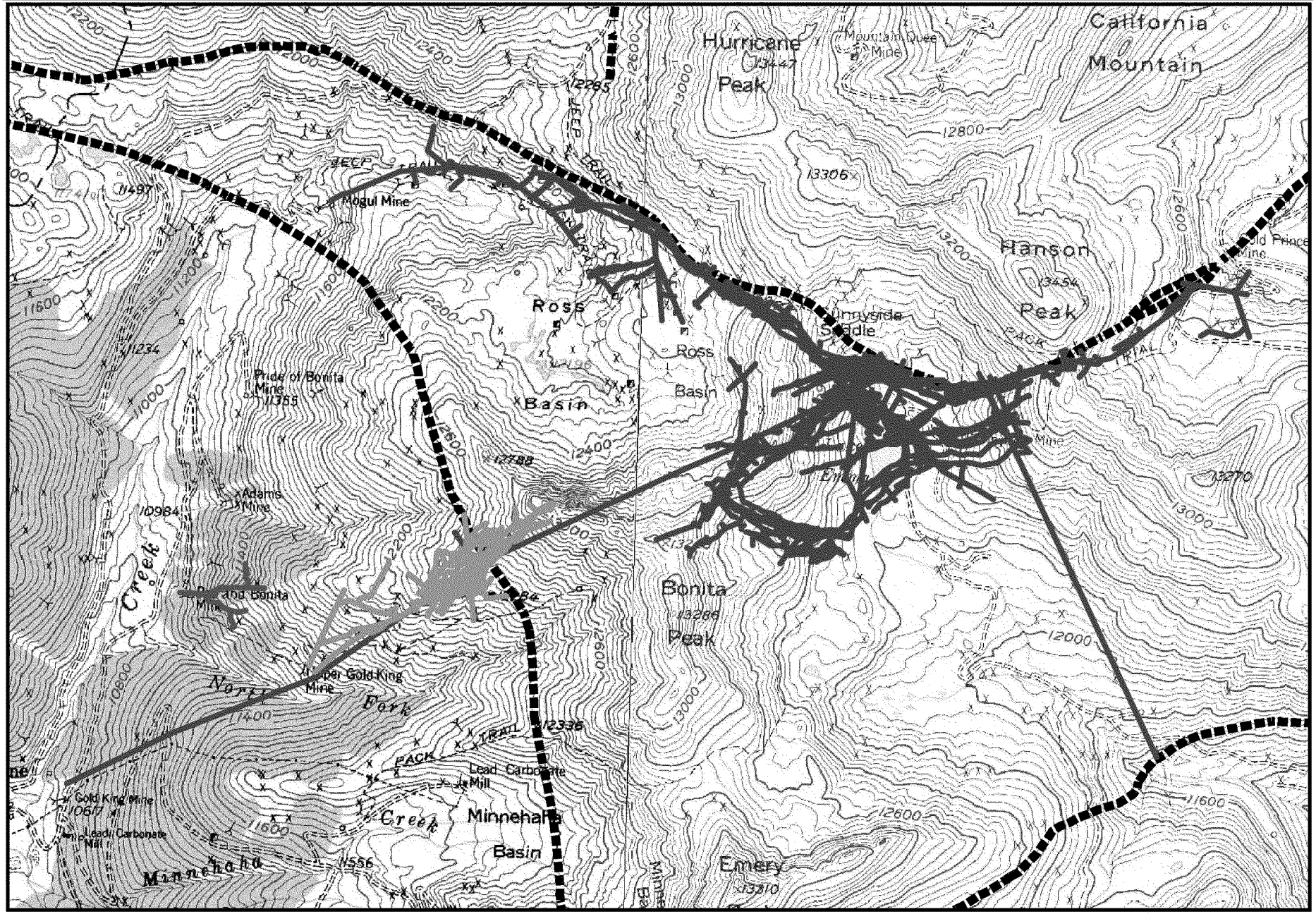
0 0.5 1 Kilometers

Colorado



Area of Interest


Legend
Fault_Line
September 2011 Isotope Samples
October 2010 Isotope Sampling Locations
March 2011 Isotope Sample Locations
June 2011 Surface Water Locations
Consistent Sample Locations
Mine Sites
Stream / River
Columbia Mine
Upper Queen Anne Mine
Queen Anne Mine
Approximate Ross Basin Fault
USCC02D
CC01U
Mogul North Mine
Mogul Mine
USCC02D
CC01CL
CC01S
Grand Mogul
USCC02D
CC02D
CC01C
CC01C
CC01F
CC01F
Mogul South Mine
UASW02U
Lower Ross Basin Mine
Approximate Bonita Fault
Cement Creek
Pride of Bonita Mine
Adelphin Mine
Adams Mine
Gold King Mine - Upper Sampson
Gold King Mine - Paul Level
CC03C
Red and Bonita Mine
CC03D
Gold King Mine - Sampson Level
Gold King Mine - #1 Level
Red and Bonita Mill
Salomon Group
Gold King Mine - #7 Level
CC06
CC08
North Fork
CC04
CC04
CC04
Mocking Bird Mine
Benitoite Mine
Lead Carbonate Mine
CC19
American Tunnel Level of Sunnyside Mine (Gold King Mill Level Tunnel)
Gold King Mill
Lead Carbonate Mill
URS
OPERATING SERVICES
Water Quality Report
Four Mines Within Cement
Creek Watershed
Figure 2: Sampling Locations
UOS - START-3
TDD No. 1008-01
07/2012
Source: Bing Maps



Prepared by Kirstin Brown, CDRMS, 1/21/2014

0 625 1,250 2,500 3,750 5,000 Feet

RED AND BONITA MAP
Mine Workings past cave-ins are only projected to line of sight
SUNNYSIDE WORKINGS
Most Recent workings, needs more work
GOLD KING WORKINGS
There is more data that needs to be added on 7 Level

Legend

- R & B Workings (Stover)
- GoldKing1thru7
- SunnysideWorkings
- USGS Mapped Faults PP 1651

N W E S

1781609

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Cement Ck – Adits 2005 to 2012

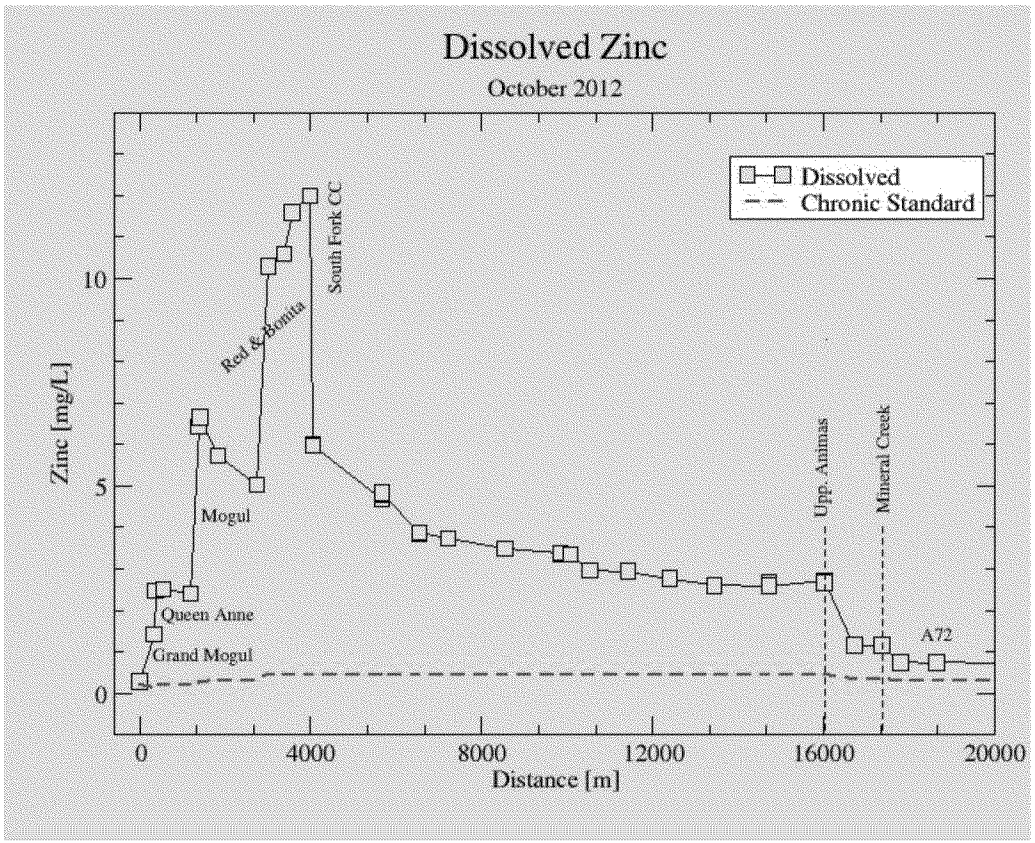
Mine Adit Discharge 2005 to 2011

Mine	Elevation (feet AMSL)	Bulkhead Install	Flow Rate (gpm)					
			July 2005	September 2005	October 2006	Average 2010	Average 2011	Oct 2012
Mogul (pH 3.5)	11,376	2003	21	27	11	54	56	90 (?)
Gold King 7 Level (pH 2.5 to 5)	11,386	None	42	135	314	206	140	55 – 85
Red & Bonita (pH 6)	**10,893**	**None**	**210**	**224**	**233**	**216**	**319**	**202**
American Tunnel (pH 5)	10,540	1997 2001 2002	95	90	84	101	101	103

gpm – Gallons per minute.

Part IV: Results

Concentrations and Water Quality Standards



Above std, entire study reach:

Al, Cd, Zn

Above std, top to Cascade Cr:

Fe

Above std, Mogul to Mineral:

Mn

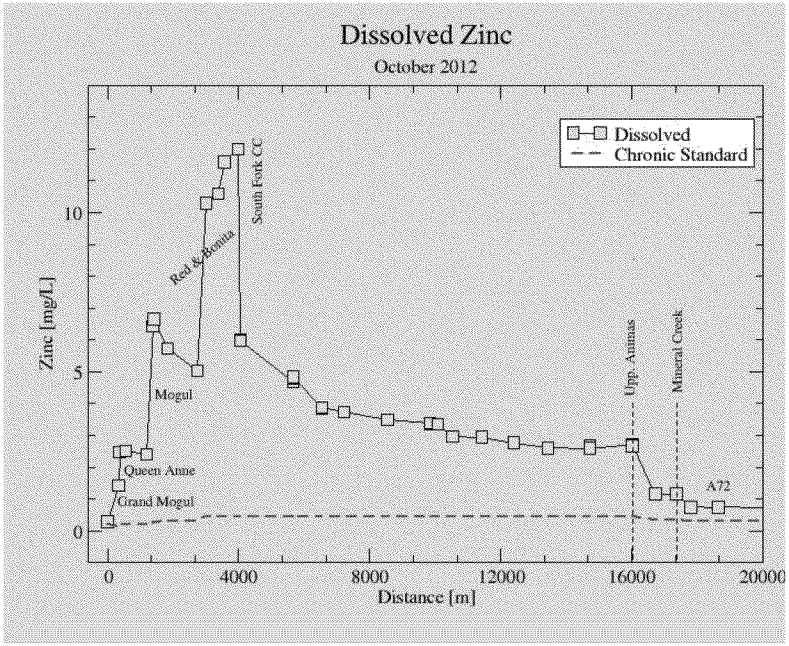
Above std, top to cement mouth:

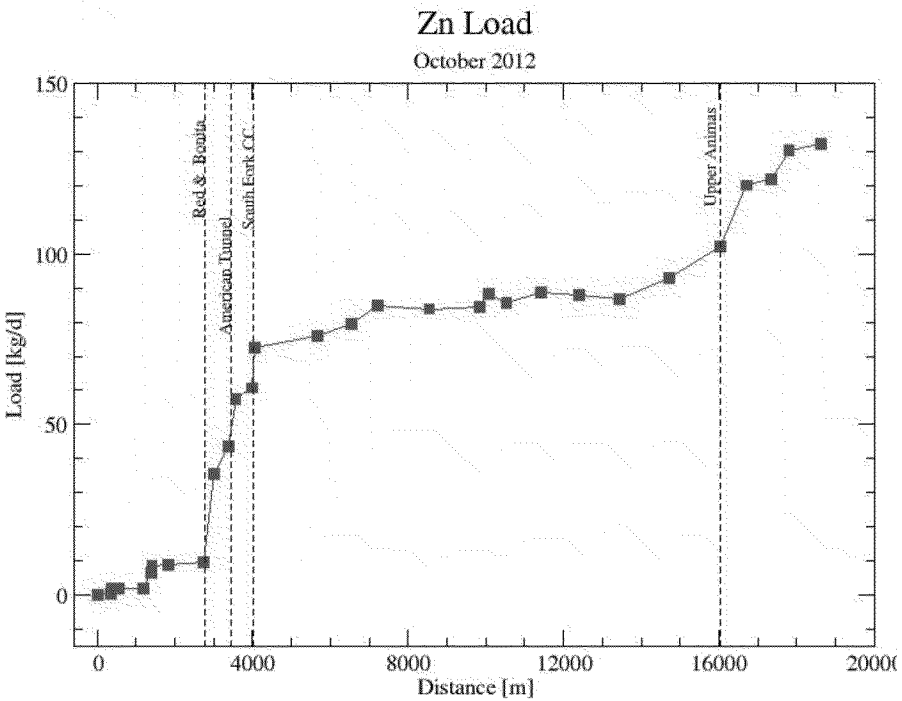
Cu

Above std, sub1 to cement mouth:

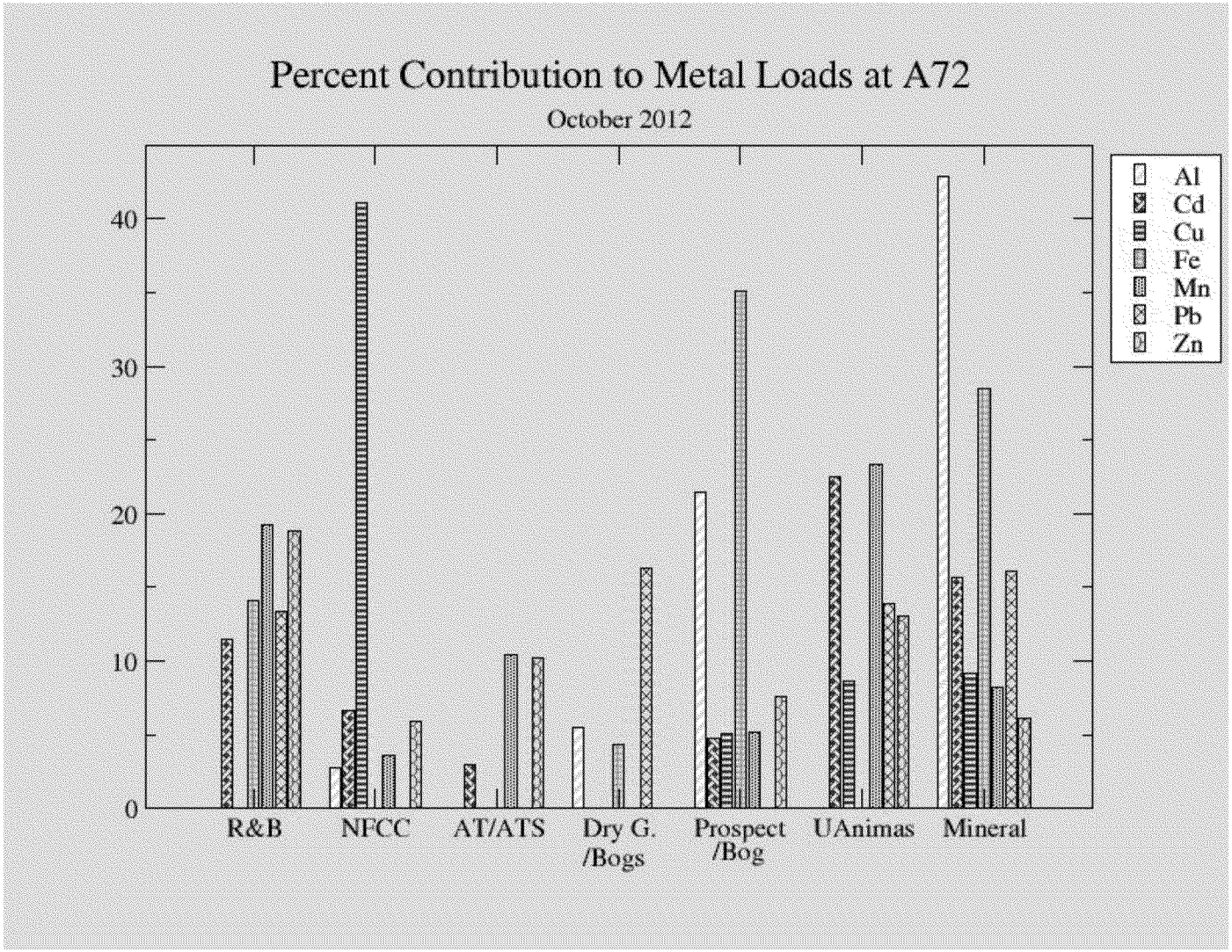
Pb

Part IV: Results – Loads & Sources





Part IV: Results – Loads & Sources



Total Metals/pH/Flow (Oct 2012) - Animas R and Cement Ck

A72 (ug/l) below Silverton	CC48 (ug/l) above Animas R	A68 (ug/l) above CC confluence	CC03C (ug/l) Red n Bonita adit
Al = 2620	**Al = 7670**	**Al = <100**	**Al = 4540**
Cd = 2.12	**Cd = 5.74**	**Cd = 1.51**	**Cd = 32.4**
Pb = 4.77	**Pb = 13.5**	**Pb = 3.42**	**Pb = 84.5**
Zn = 726	**Zn = 2560**	**Zn = 402**	**Zn = 16,100**
pH = 5.98	**pH = 3.4**	**pH = 7.42**	**pH = 5.31**
Flow = 74	**Flow = 14**	**Flow = 27**	**Flow = 0.45**

Adit Loading Analysis Conclusion

- Red and Bonita contributes approximately 18% of the Zn and 12% of the Cd load in Oct 2012 in the Animas at A72 (relative source contributions vary seasonally)
- The flow from Red and Bonita averages approximately 300 gpm and appears to have stabilized since the Am Tnnl plugs
- Zn and Cd are two of the primary contaminants of concern based on the Screening Level Ecological Risk Assessment
- No other single mine source contributes as much Zn in either Cement Ck or the Animas
- USGS reactive / transport modeling indicates that the Zn from R n B adit is conserved in transport to A72

Red and Bonita Valve-Controlled Bulkhead Considerations

- Underground investigations indicate favorable rock conditions exist at 270 ft inby
- Mine workings evaluations indicate that the R n B is not connected to other mines
- Flow management of the R n B discharge would allow for direct observation of the effectiveness of adit source control options
- Contaminant concentration reduction the Animas would be near immediate and monitored over time to assess if other releases develop
- Seasonal release of mine water is possible as necessary if other discharge points are identified as a result the increased hydraulic head in the area
- Conveyance of mine water for potential water treatment is possible
- Adit stability is increased for the long term
- Gold King -7 Level investigation recommended concurrently